CLAIMS

1. Process for current limiting (1) with a current limiting device (1) which comprises stationary electrodes (2a, 2b) and at least one movable electrode (3, 3'), in the first operating state between the stationary electrodes (2a, 2b) an operating current (I_1) being routed on a first current path (30) through the current limiting device (1) and the first current path (30) being routed at least partially through the movable electrode (3, 3') which is in the first position (x_1, l_1), in a second operating state at least one movable electrode (3, 3') being moved automatically by an electromagnetic interaction with the overcurrent (I_2) which is to be limited along one direction of motion (x, l) into at least one second position (x_{12}, x_2, l_{12}, l_2), the movable electrode (3, 3') in a transition from the first position (x_1, l_1) to the second position (x_{12}, x_2, l_{12}, l_2) being guided along one resistance element (5) and in at least one second position (x_{12}, x_2, l_{12}, l_2) being in series with the resistance element (5) and thus a current-limiting second current path (31) being formed by the current limiting device (1) which has a definable electrical resistance (R_x, R_1), characterized in that in the third operating state the movable electrode (3, 3') is in series with the insulator (8) and thus an insulating clearance (32) for circuit breaking by the device (1) is formed.

2. Process as claimed in claim 1, wherein the third operating state is triggered by an interruption command by which an external magnetic field (B_{ext}) is reversed between operation of the device (1) as a current limiter and as a circuit breaker.

3. Process as claimed in one of the preceding claims, wherein in the third operating state

a) the movable electrode (3, 3') is moved along the opposite direction of motion (-x, -l) into at

least one third position (x_{13}, x_3, l_{13}, l_3) and

b) in at least one third position (x_{13}, x_3, l_{13}, l_3) the movable electrode (3, 3') is in series with the insulator (8).

4. Process as claimed in one of the preceding claims, wherein

a) the movable electrode (3, 3') is automatically guided along the resistance element (5) to an extreme second position (x_2, l_2) by the electromagnetic interaction with the overcurrent which is to be limited (I_2), and

b) the extreme second position (x_2, l_2) lies in the area in which the resistance element (5) passes into an insulator (8) so that the insulating clearance (32) for current interruption is formed.

5. Process as claimed in one of the preceding claims, wherein

a) the resistance element (5) for achieving a gentle interruption characteristic with an electrical resistance (R_x, R_l) which rises nonlinearly along the direction of motion (x, l) of the movable electrode (3, 3') for the second current path (31) is chosen and/or

b) the resistance element (5) is ohmic and the electrical resistance (R_x, R_l) increases continuously with the second position (x_{12}, x_2, l_{12}, l_2).

6. Process as claimed in one of the preceding claims, wherein

a) the second operating state is automatically activated by the overcurrent (I_2) by the currently-carrying movable electrode (3, 3') being moved by the electromagnetic force (F_{mag}) which is

perpendicular to the current (I_2) through the movable electrode (3, 3') and perpendicular to the magnetic field (B_{ext}, B_{int}) and which has one force component parallel to the direction of motion (x, l),

b) the magnetic field (B_{ext}, B_{int}) is chosen as an external magnetic field (B_{ext}) and/or as an internal magnetic field (B_{int}) which is produced by a current feed (2a, 2b; 20) to the current limiting device (1).

7. Process as claimed in one of the preceding claims, wherein

a) the electrical resistance (R_x, R_l) as a function ($R_x(x_{12})$, $R_l(l_{12})$) of the second position (x_{12}, l_{12}) and a path-time characteristic ($x_{12}(t)$, $l_{12}(t)$) of the movable electrode (3, 3') along the direction of motion (x, l) are be chosen such that

a) in every other position (x_{12}, x_2, l_{12}, l_2) of the movable electrode (3, 3') the product of the electrical resistance (R_x, R_l) and the current (I_2) is less than the arc ignition voltage (U_b) between the movable electrode (3, 3') and the stationary electrodes (2a, 2b) and optionally the intermediate electrodes (2c) and/or

b) sufficient steepness of current limitation for controlling line-induced short circuit currents (i(t)) is achieved.

8. Process as claimed in one of the preceding claims, wherein

a) the movable electrode (3, 3') comprises a liquid metal (3) which is located in at least one channel (3a) of the current limiting device (1) and can be moved along the vertical extension of the channel (3a) between the first current path (30) for the operating current

(I_1), the second current path (31) for current limiting and the insulating clearance (32) for current interruption and

b) especially wherein several channels (3a) are separated from one another by wall-like segments (5a, 8a) which in the area of the first current path (30) have intermediate electrodes (2c) for transmitting the operating current (I_1), in the area of the second current path (31) have individual resistances (5a) of the resistance element (5) and in the area of the insulating clearance (32) pass into segments (8a) for current insulation.

9. Process as claimed in one of the preceding claims, wherein

a) the movable electrode (3, 3') comprises a solid-state conductor (3') with at least one sliding contact (2d) and in the first operating state with the stationary electrodes (2a, 2b) in the second operating state is electrically connected at least on one side to the resistance element (5) and in the third operating state at least on one side is connected to the insulator (8) and

b) especially wherein the solid-state conductor (3') is made essentially of lightweight metal and/or in a lightweight construction and/or the sliding contact (2d) is wetted with liquid metal for reducing friction.

10. Current limiting device (1), especially for executing the process as claimed in one of the preceding claims, comprising stationary electrodes (2a, 2b) and at least one movable electrode (3, 3'), in the first operating state between the stationary electrodes (2a, 2b) there being a first current path (30) for the operating current (I_1)) and the first current path (30) is routed at least partially through the movable electrode (3, 3')) which is in the first position (x_1, l_1), electromagnetic drive

means (2a, 2b, 20; 11; B_{int}, B_{ext}) being present for movement of the movable electrode (3, 3') along one direction of motion (x, 1) into at least one second position (x_{12}, x_2, l_{12}, l_2), which movement is automatic in an overcurrent (I_2), electrical resistance means (5) with a definable electrical resistance (R_x) being present and in the second operating state the movable electrode (3, 3') being at least partially in series with the resistance means (5) and together with them forming a second current path (31) on which the operating current (I_1) can be limited to the current (I_2) which is to be limited, wherein in the third operating state the movable electrode (3, 3') is in series with the insulator (8) and thus an insulating clearance (32) for power interruption by the device (1) is present.

11. Device (1) as claimed in claim 10, wherein the electromagnetic drive means (2a, 2b, 20; 11; B_{int}, B_{ext}) comprise magnetic field means (2a, 2b, 20; 11) for producing the magnetic field (B_{ext}, B_{int}) which exerts a Lorenz force (F_{mag}) with a force component parallel to the direction of motion (x, l) on the movable electrode (3, 3') through which the current (I_1, I_2) has flowed so that the movable electrode (3, 3') can be moved between the first current path (30) for the operating current (I_1), the second current path (31) for current limitation, and the insulating clearance (32) for current interruption.

12. Device (1) as claimed in one of claims 10-11, wherein

a) the magnetic field means (2a, 2b, 20; 11) comprise the current supply (2a, 2b; 20) to the current limiting device (1) in order to produce an internal magnetic field (B_{int}) which is dependent on the overcurrent (I_2) which is to be limited and/or

b) the magnetic field means (2a, 2b, 20; 11) comprise means (11) for producing an external

controllable magnetic field (B_{ext}).

13. Device (1) as claimed in one of claims 10-12, wherein

a) the magnetic field (B_{ext}, B_{int}) is designed according to an overcurrent (I_2) which is to be limited and the path-time characteristics (x(t), l(t)) of the movable electrode (3, 3') which is necessary for this purpose in the second current path (31) and/or

b) the resistance means (5) for arc-free current limitation have an electrical resistance (R_x, R_l) which increases nonlinearly along the direction of motion (x, l) up to an extreme second position (x_2, l_2) for the second current path (31).

14. Device (1) as claimed in one of claims 10-13, wherein

(a) the movable electrode (3, 3') comprises a liquid metal (3) which is moved by the magnetic field means (2a, 2b, 20; 11) in the liquid aggregate state and/or

b) the movable electrode (3, 3') comprises a solid-state conductor (3') with at least one sliding contact (2d), the solid-state conductor (3') being raised on one side or both sides by the magnetic field means (2a, 2b, 20; 11) against a resetting force (F_r), especially against the force of gravity.

15. Device (1) as claimed in one of claims 10-14, wherein

a) the first current path (30) for the operating current (I_1), the second current path (31) for current limitation and the insulating clearance (32) are essentially perpendicular to the direction of motion (x, 1) and/or essentially parallel to one another and/or

b) at least one insulating clearance (32) for current interruption is located above the second

current path (31) and/or underneath the first current path (30).

16. Electrical switchgear assembly, especially high voltage or medium voltage switchgear assembly, characterized by a device (1) as claimed in one of claims 10-15.